

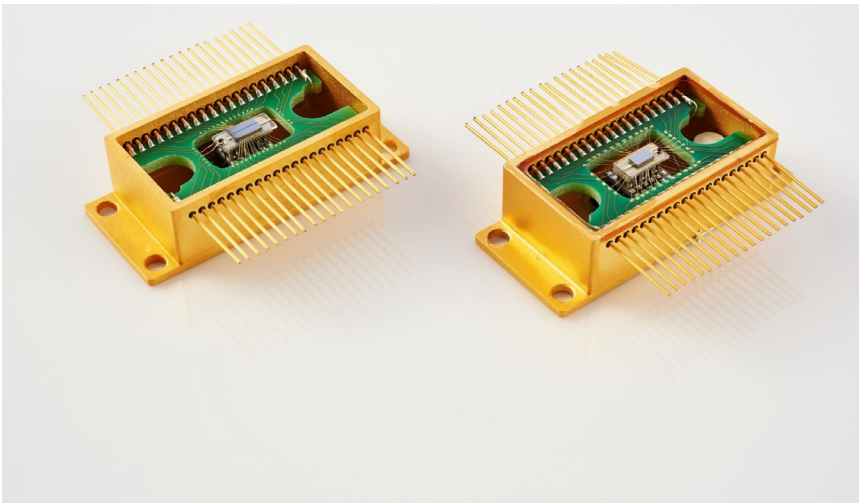


# Electro Optical Components, Inc.

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## Multi-element detectors and modules – MCT / InAsSb

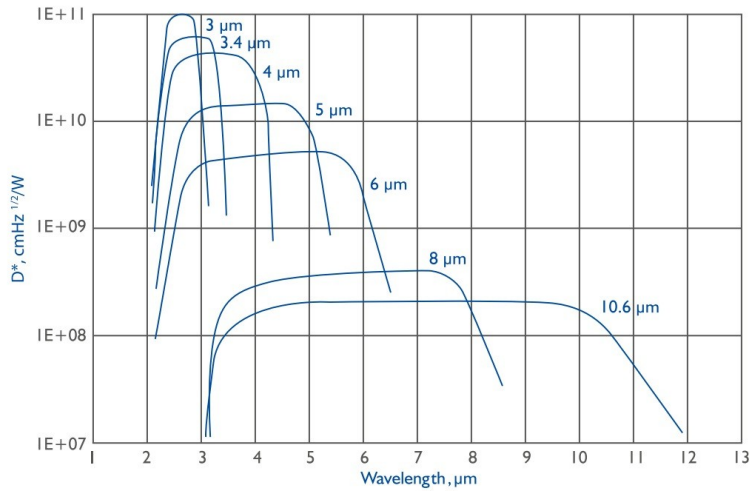
VIGO System's 32-element array is now available, with dedicated preamplifier.

The detectors line is a set of individual active elements and the signal of each of them is output independently. A multi-element detector, unlike a single-element detector, allows to record radiation of different wavelengths at the same time.

VIGO specializes in customized detectors and modules dedicated to the client's application. 32-element arrays are now available in production with dedicated preamplifiers.

Most of the multi-element detectors produced in the VIGO System are based on HgCdTe (epitaxial HgCdTe heterostructure) photovoltaic detectors, thermoelectrically cooled.

Chart 1 presents examples of spectral characteristics and Table 1 – parameters of detectors optimized for different wavelengths.



**Chart 1. Exemplary spectral detectivity.**

**Table 1. Detectivity and time constant of HgCdTe detectors.**

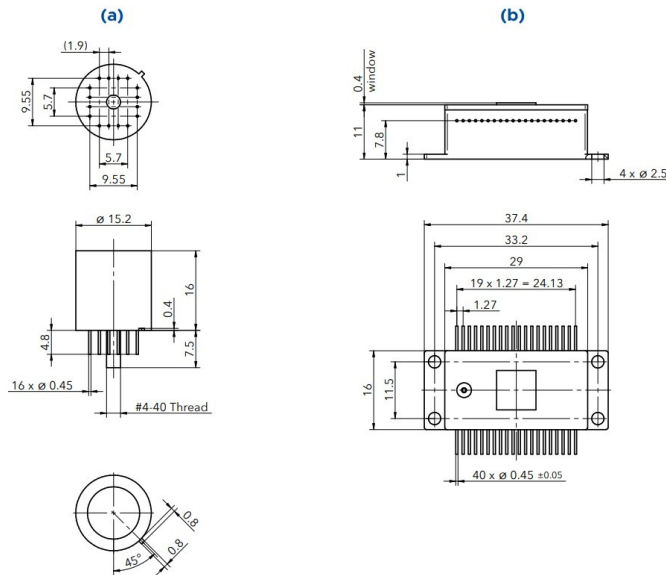
Optimum wavelength $\lambda_{opt}$ , $\mu\text{m}$	3.0	3.4	4.0	5.0	6.0	8.0	10.6
Detectivity $D^*$ ( $\lambda_{opt}$ ), $\text{cm}\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 7.0 \times 10^{10}$	$\geq 4.0 \times 10^{10}$	$\geq 3.0 \times 10^{10}$	$\geq 9.0 \times 10^9$	$\geq 2.0 \times 10^9$	$\geq 2.0 \times 10^8$	$\geq 1.0 \times 10^8$
Time constant $\tau$ , ns	$\leq 280$	$\leq 200$	$\leq 100$	$\leq 80$	$\leq 50$	$\leq 45$	$\leq 10$

Our technological capabilities also allow the production of multielement detectors with InAsSb (*indium arsenide antimonide*) using the MBE (*Molecular Beam Epitaxy*) method.

These devices are complying with the RoHS Directive. They are designed for applications where higher resistance to difficult operating conditions should be ensured.

The great advantage of VIGO System multielement detectors is that there is no need for cryogenic cooling. This results in a reduction in the size and weight of the device, and hence a reduction in power consumption.

Figure 1 shows the dimensions (unit: mm) of T08 16pin (a) and flatpack 40pin (b) housings in which VIGO System multielement detectors are mounted.



**Figure 1. Mechanical layout.**

### Key features of the product

#### Advantages:

- **High sensitivity**
- **High-speed response**
- **Convenient cryogenic-free operation**

The key advantages of VIGO System multielement detectors are very high accuracy and measurement speed. In temperature measurements, accuracy of a single millikelvin is achieved, even when measuring an object present in the field of view for only a few microseconds.

In spectrophotometry, these advantages allow obtaining high-quality measurements in a short time. Measuring the entire spectral range at the same time shortens the measurement time (compared to the time needed for scanning and full spectrum analysis in one-piece detectors).

Table 2 presents the parameters of VIGO System multielement detectors, selected for the needs of individual applications.

**Table 2. Parameters.**

Parameter	Value
Array format	linear or bilinear, up to 32 elements
Active elements material	HgCdTe or InAsSb
Detector type	PV (phtovoltaic) or PC (photoconductor)
Operating wavelength	MWIR ( $\lambda_{\text{cut-off}}$ : 3.0 to 8.0 $\mu\text{m}$ ) LWIR ( $\lambda_{\text{cut-off}}$ : 8.0 to 14.0 $\mu\text{m}$ ) $\lambda_{\text{cut-on}}$ can be optimized upon request
Pixel size	minimum 25x25 $\mu\text{m}$
Cooling	2- or 3-stage TEC
Active elements temperature	210 – 270 K

Parameter	Value
Temperature sensor	thermistor or diode (accuracy up to $\pm 1$ K)
Time constant	1 – 500 ns
Package	T08 16pin or flatpack 40pin
Window	Si/Al <sub>2</sub> O <sub>3</sub> /Ge with or without anti-reflection coating, planar or wedged
Ambient temperature	0 to 70°C
Storage temperature	-20 to 50°C

VIGO System multielement detectors are offered with a wide range of accessories. Accessories can be tailored to the needs of application and integration with the user's system.

Table 3 shows the examples of solutions.

**Tabela 3. Accessories.**

Accessory	Description
TEC controller	onboard analog controller
Lens mount	C-mount 1" or SM1 THORLABS
Preamplifier	ultra-low noise, selectable bandwidth
DAQ	SPI or USB HS

### Applications

Multielement detectors are used in point, non-contact temperature measurements of fast moving elements. Real-time monitoring of temperature of external and internal wheel bearings and high-speed train brakes can serve as an example. As other examples can also be used: temperature measurements on production lines, anomaly detection, monitoring of cooling or combustion profiles.

Currently available spectrophotometers usually use the near infrared range of 0.8-2.5  $\mu\text{m}$ . Organic compounds, greenhouse gases, hydrocarbons can be more precisely observed in the MWIR (3.0 – 8.0  $\mu\text{m}$ ) and LWIR (8.0 – 14.0  $\mu\text{m}$ ) ranges. The use of multielement detectors allows to eliminate the need for filters or use moving mechanical elements for scanning the spectra or space, and, consequently, eliminates errors related to their work. **VIGO System multielement detectors allow for high-quality spectrophotometric measurements in a short time and very low noise also allows for operation with low-power sources: thermal or IR diodes.**

High performance optical sorting systems are another application of multielement detectors. The detector line allows imaging elements moving on the tape and testing the chemical composition. Optical sorting can be used in the mining, food, chemical and pharmacological industries.